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Whether you own a gas-powered or diesel-powered coach, a well-running gen set is a valuable asset.

Our motorhomes include a number of items that are pretty important, and when we need them, we really need them. The auxiliary generator ranks at the top of that list, for several reasons, but the most important is that in severe weather, its failure to function can be life-threatening. In ordinary circumstances, it could create a major inconvenience or prematurely terminate a long-planned trip.

With a few exceptions, most generator maintenance closely parallels that which is necessary for an automotive engine. Since generators come in a wide selection of sizes and styles, the type and frequency of maintenance will vary somewhat.

Two basic styles of engines are used to power the electrical generator (or alternator): diesel and gasoline. The gasoline engine may be modified to accept propane, which may be either vapor or liquid, but this does not affect the importance of maintenance. The three different basic electrical designs are as follows:

- 1,800 rpm with a four-pole field/armature
- 3,600 rpm with a two-pole field/armature
- variable speed with an electronically controlled output

Many factors are examined when the generator manufacturers formulate their maintenance schedules. Engine speed, wear factors, and experience are major considerations.

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GENERATOR MAINTENANCE

SCHEDULED MAINTENANCE

There is no substitute for the owners manual when it comes to establishing a generator maintenance schedule. This little booklet is your best source of information for the care and use of the equipment.

The very first maintenance occurs after the break-in period for the initial **oil and oil filter change**. Typically, the owners manual will suggest changing the oil and filter after the first 20 to 50 hours of operation. The engine will not be fully broken in, as the term might imply, but the initial wear particles need to be removed. Then you will be told to change the oil and filter on a regular schedule thereafter — typically after every 100 to 150 hours of operation or once every 12 months. Some of the diesel engines have a larger oil capacity and thus a longer run-time on the oil — as much as 200 to 250 hours between oil and filter changes — but their manufacturers still recommend changing them at least once every 12 months. I like to write the date and generator hours right on the newly installed filter, in addition to keeping a written log for all maintenance.

The **air filter** is just as important as the oil filter and should not be overlooked. A dirty air filter will restrict proper air intake and change the air-fuel ratio to a slightly richer mixture. This increases fuel consumption, reduces horsepower, and causes the engine to run hotter. There is also the danger that the increased negative pressure on the back side of the filter will put little holes in the filter material and pull dirty air into the cylinders, causing increased wear. A severely clogged air filter can prevent normal generator use entirely. Generators operated in dusty or dirty environments will require a filter change much sooner than the normal recommended time, just as your motorhome or car would. Usually, an annual change requirement is not given for the air filter, and the recommended schedule varies widely for different equipment, so rely upon the owners

manual for the proper hourly maintenance interval.

The **fuel filter** is the next item on the maintenance schedule. The usual recommendation is that it be replaced at 250 to 500 hours. Although most have no annual change requirement, I like to replace the fuel filter at every other oil change, even if the hours haven't elapsed. The generator's owners manual also will note when and if injector service, valve adjustments, or any other service is necessary.

For a proper break-in of the engine, the owners manual will give you recommendations for a **load schedule** to follow for the first few hours of use. This will avoid a very early full load

operation that might cause overheating and premature wear. Normally you should not load the generator at more than 50 percent of its output capacity for the first few hours; refer to the manual for the specifics for your particular generator.

Footnotes are always included on the maintenance recommendations, cautioning you to use a more frequent schedule when operating in extreme temperatures or dusty environments. For personal safety, thoroughly inspect the exhaust system at every opportunity, and make sure you have a functioning carbon monoxide alarm inside the motorhome. Avoid sleeping with the generator running. Also be sure to disable the auto-start

AVOIDING CARBON MO

Carbon monoxide (CO) is an odorless, tasteless, and colorless gas that is produced by sources such as gasoline engines, diesel engines, and propane-fueled appliances. Avoiding exposure to this potentially fatal gas, known as the silent killer, is critical to RV users.

The symptoms of carbon monoxide poisoning include headache, weakness, drowsiness, decreased tolerance to exercise, visual disturbances, heart palpitations, nausea, and vomiting. If repeated exposure to low levels of carbon monoxide are not recognized, these symptoms — often misdiagnosed as influenza — may be chronic or recurrent.

Acute exposures to high levels of carbon monoxide can cause a rapid progression to severe poisoning, in which case the symptoms are not apparent to the victim. The signs of acute toxicity are rapid heart and respiratory rates, irregular heart rhythms, vomiting, disorientation, low blood pressure, convulsions, respiratory failure, coma, and death.

Here are 15 recommendations to reduce the risk of CO poisoning:

1. The most important recommendation: **USE A CARBON MONOXIDE WARNING ALARM**. As is true of a smoke alarm, reliance on a CO alarm is acceptable only if the device is in good working order and is tested periodically as directed by the manufacturer. Alarms have a recommended replacement age, which can be obtained from the product literature or from the manufacturer. The devices wear out and do not function as well, plus advances in technology continue to be made. Look for an alarm that meets Underwriters Laboratories (UL) standard 2034.
2. Inspect your RV's chassis and generator exhaust system regularly, at least before each outing and after bottoming out or any other incident that could cause damage.
3. Inspect the RV for openings in the floor or sidewalls. If you locate a hole, seal it with a silicone adhesive or have it repaired before using your generator again.

(if you have one) before doing any maintenance, when refueling your motorhome, or when storing your motorhome in an enclosed building. Don't start or stop the generator under a load and, conversely, don't run it for long periods without a load.

Gasoline will deposit a varnish in the carburetor if the generator is left idle for a few weeks. This varnish will cause the engine to malfunction in a variety of ways, and it may be necessary to have the carburetor rebuilt to cure the problem. The good news is that it is easily prevented just by running the generator, under a 50 percent load, for two hours every 30 days. Adding a fuel stabilizer to the gasoline also will help prevent var-

nishing, but be sure to run the engine after adding the stabilizer to circulate the stabilizer through the carburetor. Read the label to determine the proper amount of treatment. I would probably run the engine every 30 days like the owners manual says, especially for longer out-of-service periods. Fuel-injected engines are not subject to the varnishing effect to the same degree as carbureted engines, but, again, I would follow the recommendations in the owners manual and exercise the generator when out of service, as called for.

If your generator cranks but will not start, check to make sure that there is enough fuel (gas or diesel) in the tank for the generator to operate. While

NOXIDE POISONING

4. Inspect windows, door seals, and weather strips to ensure that they are sealing properly.
5. Yellow flames in propane-burning appliances such as coach heaters, stoves, ovens, and water heaters usually indicate a lack of oxygen. Determine the cause of this condition and correct it immediately.
6. If applicable, have your built-in vacuum cleaner checked to make sure it does not exhaust under the underside of your RV. Have the system changed if it does.
7. Do not operate your generator if the exhaust system is damaged in any way or if an unusual noise is present.
8. Park your RV so that the exhaust may easily dissipate away from the vehicle. Do not park next to high grass or weeds, snowbanks, buildings, or other obstructions that might prevent exhaust gases from dissipating as they should.
9. Keep in mind that shifting winds may cause exhaust to blow away from the coach one moment and under the coach the next.
10. When stopping for long periods of time, be aware of other vehicles around you, such as tractor-trailers at rest stops that may have their engines and refrigerators running.
11. Do not sleep with the generator operating.
12. Leave a roof vent open anytime the generator is running, even during the winter.
13. If you do not feel well, do not be fooled into thinking that it is because you have been driving too long, you ate too much, or you are suffering from motion sickness. Shut off the generator and step outside for some fresh air just to be sure.
14. Consider parking in the "No Generator" zone that FMCA makes available at its international conventions.
15. Post the accompanying warning sign (on page 82) where anyone using your RV will see it. It may save a life.

TROUBLESHOOTING TIPS

FAILS TO CRANK OR CRANKS SLOWLY

- Low battery
- Bad battery connections
- Trying to start under load

CRANKS BUT WILL NOT START

- Fuel below minimum level
- Low oil level may prevent spark
- Spark plugs or spark plug wires

STARTS BUT EMITS BLACK SMOKE

- Very dirty air filter
- Choke stuck
- Dirty or varnished carburetor

RUNS BUT SURGES

- Needs carburetor adjustment
- Needs speed control (governor) adjustment
- Needs general tune-up

the motorhome's engine may operate and the fuel gauge may show that there is fuel in the tank, remember that the motorhome's fuel system will cut off the fuel supply to the generator to keep a reserve available for the engine. This is done so that prolonged use of the generator will not drain the tank and leave the motorhome stranded with no fuel. Your owners manual should indicate where that cutoff point is for your fuel system.

MANUFACTURER RECOMMENDATIONS

Always follow the manufacturer's recommendation for the type and grade of oil, and the oil, fuel, and air filters. A fuel requirement for gasoline, LP-gas, or diesel fuel also will be listed. The owners manual may include restrictions on the use of ethanol and methanol blends of gasoline; restrictions on the use of propane blended with butane; and

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WARNING

EXHAUST GAS IS DEADLY!

Exhaust gases contain carbon monoxide, an odorless and colorless gas formed during the combustion of hydrocarbon fuels. Carbon monoxide is poisonous and can cause unconsciousness and death. Symptoms of carbon monoxide poisoning include:

- Inability to think coherently
- Vomiting
- Muscular twitching
- Throbbing in temples
- Dizziness
- Headache
- Weakness and sleepiness

If you or anyone else experiences any of these symptoms, shut down the generator and get out into the fresh air immediately. If symptoms persist, seek medical attention. **DO NOT OPERATE THE GENERATOR AGAIN UNTIL IT HAS BEEN INSPECTED AND REPAIRED.**

The best protection against carbon monoxide inhalation is proper generator installation and frequent visual and audible inspections of the complete exhaust system.

Cut out or post this warning where anyone using your RV will see it. It may save a life.

there definitely will be temperature restrictions on No. 2 diesel fuel. Read the book and be aware of the problems that might occur when the generator manufacturer's recommendations are ignored. Consider oil analysis if you are really serious about maintenance (see "Oil Analysis 101," FMC, March 2005 issue, page 62).

Also in the manual will be a list of typical loads for various appliances. No generator has an unlimited capacity. Compare the rated capacity of the generator with the loads applied. Also be aware that for normally aspirated engines (no turbo or blower), the engine power degrades approximately 3.5 percent for each 1,000 feet of altitude. This means that in the mountains of Colorado, you could lose as much as one-third of the generator's capacity just because of the reduction of atmospheric pressure.

The **coolant** in liquid-cooled engines must be tested for loss of protective additives at least on an annual basis. Test strips are available for this purpose, or your service center can do the testing at your regular service interval. Coolant testing usually is not performed unless requested. In addition, coolant should be changed out within the recommended interval as listed in your owners manual.

Please note that RV generator manufacturers do not recommend modifying your generator exhaust with aftermarket kits or self-made systems that redirect or otherwise affect the flow of a correctly installed exhaust system. Exhaust back-pressure reduces power and increases heat.

If your generator does not have an hour meter, have one installed, as a proper generator maintenance schedule is formulated on run-time. Always rely upon the owners manual for maintenance change intervals, as these hourly intervals noted above are generalizations. Take care of the gen set and it will take care of you, especially at that critical time. **FMC**